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ABSTRACT

This study examined the educational records of 36 children who met all or most of the criteria for fetal alcohol syndrome (FAS) and who were referred to special education in Anchorage, Fairbanks, or Juneau (Alaska) school districts. Thirty of the children were found to have medical comorbidities independent of the findings generally associated with FAS and which by themselves could explain the special education and related services they received. Qualifying conditions for children varied widely and included speech impairment (34 percent), mental retardation (20 percent), pre-school disabilities (14 percent), learning disability (20 percent), serious emotional disturbance (6 percent), and multiple disabilities (6 percent). The types of services received were similarly varied. Intelligence and achievement results varied from high average to severe mental deficiency. The study found that there is no consistent pattern of educational deficit or service requirement associated with FAS. Results also suggest that factors other than in-utero alcohol exposure, including exposure to other in-utero toxins, child abuse and neglect, poverty, and exposure to a chaotic social environment, may determine neurologic and developmental outcomes for children diagnosed with FAS. The study concluded that designating FAS as a qualifying condition for special education services does not seem warranted. (Contains 22 references.) (DB)

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The Educational Attainment of Children with Fetal Alcohol Syndrome

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Executive Summary

This report documents the educational attainment of children diagnosed with fetal alcohol syndrome (FAS) who received special education and related services. From a total of 248 children in Alaska with a medical chart notation of FAS identified in a previous study, we identified 53 who received services through the Anchorage, Fairbanks, or Juneau School Districts. Of these 53 children, 32 had a medical chart notation documenting all five criteria necessary to meet the case definition for FAS, and 21 had a medical chart notation of FAS but not the specific five criteria. Fourteen of the 53 children were not referred for special education services. Of 39 children referred to special education, 35 qualified; one additional child received services under a 504 plan. The educational records for these 36 children were reviewed and compared with their medical records.

Thirty of the 36 children were found to have medical co-morbidities independent of the findings generally associated with FAS and which by themselves could explain the special education and related services they received. Qualifying conditions for children varied widely and included speech impairment (34%), mental retardation (20%), pre-school disabilities (14%), learning disability (20%), serious emotional disturbance (6%), and multiple disabilities (6%). The types of services received by children were similarly varied. Intelligence and achievement test results varied from high average to severe mental deficiency.

We conclude that there is no consistent pattern of educational deficit or service requirement associated with FAS. This suggests that factors other than in-utero alcohol exposure – including exposure to other in-utero toxins, child abuse and neglect, poverty, and exposure to a chaotic social environment – may determine the neurologic and developmental outcome of children diagnosed with FAS. Because of the lack of a characteristic FAS neurologic phenotype, and our finding that most children referred for services qualified under existing categories, designating FAS as a qualifying condition for special education services does not seem warranted.

Introduction

This report documents the educational attainment of children diagnosed with fetal alcohol syndrome (FAS). While children with fetal alcohol syndrome have characteristic facial features and abnormal growth (1), the effect of in-utero alcohol exposure on neurologic function is of greatest consequence for the individual and society. Despite extensive studies which have demonstrated the association between FAS and cognitive development (2-7), and the consequent considerable implications for public resource utilization (8,9), few studies have examined the interaction between children with FAS and the educational system.

We reviewed the educational records of a cohort of children diagnosed with FAS (10-12) and residing in the Anchorage, Juneau, or Fairbanks school districts in Alaska to identify the number evaluated for and qualifying for special education services. We attempted to identify qualifying conditions for enrollment into special education (FAS does not by itself qualify a child for special education in Alaska); the tests of achievement and intelligence used by the educational systems to evaluate and follow children with FAS and their results; special education resources used by FAS children; and the presence of defects and conditions not related to in-utero alcohol exposure which might also affect educational achievement.

Methods

Case identification and definition

In a previous study that attempted to identify and characterize all children diagnosed with FAS in Alaska, we found 248 children with a notation in their medical records suggesting that they had or may have had FAS (10-12). Children were identified from numerous data sources including private providers, agencies within the Alaska Department of Health and Social Services, Native health corporations, and the Alaska Native Health Service.

Permission was obtained from the Anchorage, Fairbanks, and Juneau school districts to review and abstract school record data on enrolled or previously enrolled students with FAS. The Alaska Native Health Service (ANHS) declined to participate in this phase of the study; consequently, the 79 FAS cases identified exclusively through the ANHS were removed from the potential study population. Seven children who were deceased were also excluded. Of the remaining 162 cases, 105 did not receive education services in Anchorage, Fairbanks, or Juneau school districts and school records were unavailable for an additional 4 cases. The remaining 53 FAS children, identified by matching name and date of birth against records from the Anchorage, Juneau, or Fairbanks school districts, were included in this evaluation. The cumulative and special education records of these 53 children were reviewed during September 1995 through June 1997.

For this investigation, children were classified as "FAS" if they met five criteria including at least one facial and one neurological abnormality consistent with FAS, growth delay, documentation of maternal alcohol consumption during pregnancy or a maternal history of alcohol abuse, and a medical chart notation by a physician of suspected or diagnosed FAS. Children who had a medical chart notation of FAS but who did not meet the five criteria case-definition for FAS were classified as "FAS-noted". A fuller description of these case definitions has been presented previously (12).

By combining information collected from school records with information collected from medical records, we identified children who had medical or social risk factors other than maternal consumption of alcohol which might help explain poor school performance. To assess the records of each child, a nationally certified school psychologist and two pediatric epidemiologists (both of whom were board-certified pediatricians) reviewed the information stored in the database for each child.

For all of the 53 children who had been referred to or received special education services, we reviewed records available at the three school districts included in the study. Children who receive special education services qualify under one of 15 categories of exceptionality (Table 1). Every year the child must have an individual education plan (IEP) to list the intended educational objectives for the child and to evaluate the child's progress in meeting those objectives. IEPs describe a child's progress and detail any significant strengths or problems a child has had during the year. We reviewed qualifying exceptionalities and IEPs for the children with special education records and noted strengths and weaknesses of individual students.

Table 1.

Eligibility Criteria for Disability Categories (Exceptionalities)

Listed below are the 15 disability categories used to determine whether a student qualifies as a child with a disability in need of special education and related services.

1. Mental Retardation
2. Learning Disability
3. Serious Emotional Disturbance
4. Deafness
5. Hard of Hearing
6. Orthopedic Impairment
7. Other Health Impairment
8. Visual Impairment
9. Speech Impairment
10. Multiple Disabilities
11. Deaf-Blindness
12. Pre-School Disabilities
13. Autism
14. Traumatic Brain Injury
15. Qualified Disabled Persons Under Section 504

Every three years, each student in special education receives a re-evaluation by a Multidisciplinary Team (MDT) which reviews the student's status and reassesses the student. The MDT can recommend the student exit special education or continue receiving services. The MDT can also change the student's exceptionality. We report the original exceptionality and any changes that occurred from the original to the latest evaluation. To determine resource utilization by children in our cohort, we reviewed the special education services received by children during the year in which the individual's chart was reviewed. Unfortunately, useable data on services were available only from the Anchorage School District.

The three districts assessed students for maladaptive behaviors, developmental delays, intelligence, and achievement using standardized instruments appropriate for the reason for the referral and the age of the child (Table 2). Because different tests were administered, scores were converted to a standard score with a mean of 100 and standard deviation of 15 points, allowing general comparisons. The "full scale" score was used. Group achievement scores were also converted to standard scores for comparison purposes.

Table 2.

Measures of Achievement
California Achievement Tests, Fifth Edition (CAT/5) - a group administered test series usually used to measure academic functioning and skills in a variety of scholastic areas.
Iowa Tests of Basic Skills (ITBS) - a group administered test series usually used to measure academic functioning and skills in a variety of scholastic areas.
Wechsler Individual Achievement Test (WIAT) - an individually administered test of academic ability usually used to assess a wide variety of academic skills and functioning.
Wide Range Achievement Test – Third Edition (WRAT 3) – an individually administered screening of academic ability usually used to assess skills and functioning in the areas of word recognition, spelling, and arithmetic calculation.
Woodcock-Johnson Tests of Achievement (WJ-R ACH) – an individually administered test of academic ability usually used to assess skills and intra-achievement discrepancies across a wide variety of academic areas.
Mini-Battery of Achievement (MBA) - an abbreviated form of the Woodcock-Johnson Tests of Achievement. It is an individually administered test usually used to assess academic functioning in the basic skill areas of reading, writing, and math.
Peabody Individual Achievement Test (PIAT) - an individually administered screening measure usually used to assess academic functioning in the areas of reading recognition and comprehension, spelling, math, and general information.
Measures of Intelligence / Cognitive Ability / Mental Processing
Kaufman Adolescent and Adult Intelligence Scale (KAIT) – an individually administered test of intelligence usually used to help predict academic achievement and establish current intellectual functioning.
Kaufman Assessment Battery for Children (KABC) - an individually administered test of mental processing and academic achievements used to clarify achievement levels and simultaneous and sequential mental processing skills.
Stanford-Binet Intelligence Scale: Fourth Edition - an individually administered test of intelligence usually used to help predict academic achievement and establish current intellectual functioning.
Wechsler Intelligence Scales - individually administered tests of intelligence usually used to help predict academic achievement and establish current intellectual functioning. The Wechsler Scales include the *Wechsler Preschool and Primary Scale of Intelligence (WPPSI)*, the *Wechsler Intelligence Scale for Children (WISC)* and the *Wechsler Adult Intelligence Scale (WAIS)*. The *WPPSI* is in a revised edition and the *WISC* and *WAIS* are in their third edition.
Woodcock-Johnson Tests of Cognitive Ability – Revised (WJ-R) - a comprehensive individually administered set of tests used to assess cognitive ability and related academic aptitude. Broad cognitive ability (extended scale) is a measure of overall intellectual functioning based on an average of various cognitive abilities such as short-term memory, comprehension-knowledge, visual processing, auditory processing, long-term retrieval, fluid reasoning, and processing speed.

The frequency of achievement test administrations per individual varied from none to five. To allow comparisons of more than one administration of an achievement test, the average score was used, and all achievement test data were consolidated across all basic skill areas. Consequently, for testing that included basic skills such as arithmetic, reading, and written expression, the standard scores were averaged to yield one "basic skills score."

Results

Of the 53 children, 32 were 5-criteria FAS cases, and 21 were FAS-noted. Of these 53 children, 39 (74%) were referred for special education services (Table 3). Of the 39, 24 were males, and 15 were females. For 38 where data were available, the age when referred for special education was 3 to 18 years (median, 5 years). Among 31 children for whom information was known, all but one spoke English as the primary language.

Table 3.

248 FAS-Noted:		
of 248:	145 met 5 criteria	
of 248:	79 returned to IHS (169 left)	
of 169:	53 records reviewed in Anchorage / Fairbanks / Juneau	
of 53 records reviewed in:		
Anchorage – 31 reviewed	6 never referred 25 referred	4 not qualified 21 qualified Special Education
Fairbanks – 13 reviewed	6 never referred 7 referred	0 not qualified 7 qualified Special Education
Juneau – 9 reviewed	2 never referred 7 referred	0 not qualified 7 qualified Special Education
of 53 - 32 are five criteria		
of 53 - 14 not referred for Special Education Services		
of 53 - 39 referred for Special Education Services		
of 53 - 35 qualified for Special Education Services		

Of the 39 children referred for evaluation, 35 (90%) qualified for special education services. In addition to the 39 children referred for evaluation, one additional child received services under Section 504 of the Rehabilitation Act of 1973 which prohibits discrimination of persons with disability in any program or activity receiving federal funding. The 36 children who received some form of special education or had accommodation under Section 504 included 24 of 27 who met the 5-criteria FAS case definition and 12 of 13 who were FAS-noted.

The 36 children who qualified for special education or Section 504 had extensive medical co-morbidity (Tables 4 and 5). Review of their medical and education records showed that 30 (83%) of these 36 children had co-existing clinical findings or risk factors for adverse health outcomes independent of those generally associated with FAS. This includes four FAS-noted children who had no specific findings of FAS noted in their medical chart despite a chart notation of this diagnosis and six children who had conditions so severe that, in themselves, they explained why the child qualified for special education services. Only 6 of these 36 children had medical findings limited to FAS diagnostic criteria.

Table 4. Conditions associated with FAS among 36 children who received a medical chart notation of FAS and who met eligibility criteria for disability categories and qualified for special education and related services in Anchorage, Juneau, or Fairbanks AK.

Condition		Number
FAS alone		6
Among FAS-noted children, absence of evidence in the medical chart to support a diagnosis of FAS		4
Absence of evidence and no other conditions	3	
Absence of evidence associated with seizures and mental retardation	1	
Presence of conditions (other than FAS) severe enough to explain education deficit		6
Extreme prematurity	4	
Head injury	1	
Partial 11-hydroxylase deficiency	1	
Other associated clinical or environmental conditions		20
Maternal illicit substance use	4	
Maternal licit substance use (possible fetal hydantoin syndrome)	1	
Congenital heart defect without other anomalies	4	
Congenital heart defect with other major anomalies	2	
Experienced abuse or placed in foster care	3	
Cleft palate	1	
Head injury	1	
Other conditions	4	

Table 5. Selected Medical and Performance Information for FAS-Noted Children (N=53)

FAS Criteria	Medical Diagnoses	Standard Scores Achievement/ Ability	Special Education
N	seizures, absent left pectoralis, 11 - hydroxylase deficiency, hyperandrogenism, hirsutism	40/53	mental retardation, other health impaired, attention deficit hyperactive disorder, preschool developmental delay
Y	rumination, cleft lip and palate, pyloric stenosis, otitis media, hypoplastic toenails, ventricular septal defect	98 / --	504 plan
Y	Esotropia, dental problems, protruding auricles, other anomalies, bilateral conductive hearing loss, family history of mother with other children with FAS	76 / 93	average range cognitive abilities, functioning below ability in math
Y	intraventricular hemorrhage, clinodactyly	95 / 88	tested but did not qualify
N	growth hormone deficiency, mid-back hair whorl, upswept hair line, camptodactyly, no alcohol history	70 / 56	serious emotionally disturbed, polysubstance abuse, history of sexual abuse
Y	hepatosplenomegaly, hirsutism, palmar crease abnormalities	81 / 79	emotionally disturbed, speech and language, history of foster care, hyperactive, destructive, post-traumatic stress disorder
Y	ptosis, esotropia, Scoliosis, otitis media, clitoral hypertrophy, hirsutism, 11-B-hydroxylase deficiency	92 / 101	tested but did not qualify
N	no history, no alcohol history	70 / 75	learning disabled, speech and language
N	reactive airway disease, 1st trimester treated for syphilis and gonorrhea	96 / --	no special education record
N	ventricular septal defect, respiratory distress syndrome	No data	no special education record
Y	crack cocaine use by mother	74 / 80	learning disabled, speech and language
Y	tetralogy of Fallot, gastro-esophageal reflux, absent distal phalanx R 5th finger, hypoplastic lateral toes, otitis media, clinodactyly	No data	speech and language related to otitis media, "Average motor skills, verbal"
Y	cerebral palsy, prematurity, retinopathy - blind in one eye, grade 3 intraventricular hemorrhage, hockey-stick palmar creases	No tests (very impaired)	multi-handicapped, wheelchair
N	obesity, possible Prader-Willi Syndrome	No scores	no special education record
Y	mother using amphetamines/barbiturates	No scores	speech impairment
Y	attention deficit disorder, clinodactyly, amblyopia	76 / 92	learning disabled, twice repeated grades, speech-language services
Y	cleft palate, otitis media, short 5th fingers	No scores	speech - language - otitis
N	seizures during infancy, simian crease, hemangioma	No scores	no special education record
Y	pectus excavatum, strabismus, pulmonic stenosis, myopia, growth problems	No tests	speech - language
Y	cleft lip and palate, ventricular septal defect, congenital heart block, hypertrichosis, polydactyly	No records	no record
Y	ventricular septal defect, perinatal asphyxia, failure to thrive, congestive heart failure	No tests	no record
Y	hydrocephalus, seizures, intraventricular hemorrhage, prematurity, hypoxic ischemia, cardiopulmonary arrest, bronchopulmonary dysplasia	Severely impaired	multi-handicapped, mental retardation
Y	Strabismus	112 / --	no records, withdrew from school 1995
Y	Myopia	105 / --	no special education record
N	possible Down s Syndrome, cocaine withdrawal	No scores	no special education record
Y	family history of FAS, heart murmur	No scores	speech impaired
N	Tegretol - fetal hydantoin syndrome, mother on phenobarbital during pregnancy, otitis media	No scores	speech impediment
Y	atrial septal defect, (L) inguinal hernia, calcaneus valgus, externally rotated hips, seizures, myoclonic jerks	No data	multi-handicapped, destructive and dangerous behavior, mentally retarded
Y	prematurity, hemiparesis, hip dysplasia, spastic diplegia	-- / 53	no special education record
Y	gas sniffing, behavior problems, conduct disorder, no history alcohol use during pregnancy	80 / 75	mild mental retardation, speech and language, learning disabled
Y	vocal cord paralysis, EEG abnormality, mild myringomalacia and tracheomalcia	No scores	developmental delay
Y	prematurity, seizures, atrial septal defect, single umbilical artery, cerebral palsy, spastic quadraplegia, feeding gastrostomy, retinopathy, chronic lung disease	-- / 56	multi-handicapped, blind services
Y	attention deficit disorder, mental retardation, impulsive	80 / 59	mentally retarded
Y	prematurity, mother polydrug abuser, speech and language delay	109 / 123	speech and language 30'/wk for articulating "R"
Y	Hypertonia, clonus @ ankles, otitis media, clinodactyly	87 / 84	speech impairment, not in spec education in 4th grade
N	features suggestive of Down s Syndrome, atrial septal defect, ventricular septal defect, mongoloid features	-- / 57	mental retardation
N	seizures, mental retardation, history of sexual assault twice	No scores (graduated)	no special education record
N	general hypotonia	No scores	no special education record
N	otitis media, mild hyperreactivity	No scores	speech - language. Fluency disorder, low average auditory discrimination
N	moderate to severe mental retardation, hip dysplasia, polysubstance abuse, family history of birth defects, homeless	53 / 59	mentally retarded, 3 previous kids removed by DFYS
Y	severe prematurity, hemangiomas	70 / --	withdrew from school
Y	congenital heart defect, posteriorly rotated ears, cafe-au-lait spots, otitis media	88 / 77	speech - language, exited in '92 - no longer needs services
N	speech - language delay	97 / --	no special education record
N	cerebral palsy, spastic diplegia, history of fractures from abuse	-- / 63	mental retardation, learning disabled, abuse/neglect environment, attention deficit disorder
Y	behavioral problems, tantrums, palmar crease abnormalities, lateral palatine ridges	No scores	speech impaired
N	developmental delay, behavior problems	No scores	tested, not qualified for spec ed
N	hyperactive, behavior problems, conductive hearing deficit	115 / --	no special education record
Y	history of head injury	61 / 60	mental retardation
N	Tremulousness	-- / 87	DFYS in home, neglect, "fighting and drinking in family", set fire to house, learning disabled
N	CMV, pneumonias, bronchiectasis	31 / 41	mental retardation, DFYS removed from home in 1993, foster parents
Y	head injury @ 3 months, infantile spasms, R hemiparesis, otitis media	No scores	speech - language, developmental disability qualification
N	seizures @ birth resolved, mother delivered while in alcohol treatment unit, extreme prematurity	36 / 71	suspended for fighting @ school, mental retardation, major behavioral problems, family dysfunction
Y		No scores	speech impairment, fine motor delay

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The exceptionalities under which the children qualified for special education services included speech impairment (34%), mental retardation (20%), pre-school disabilities (14%), learning disability (20%), serious emotional disturbance (6%), and multiple disabilities (6%). Twenty-two children had at least one review subsequent to their initial eligibility evaluation; of these, eight had their exceptionality changed. One changed from mental retardation to learning disability, one from serious emotional disturbance to mental retardation, one from speech impairment to learning disability, two from mental retardation to other health impairment or multiple disabilities, and three from pre-school disabilities to other health impairment or multiple disabilities.

Among 23 children with at least one IQ test, the frequency of test administration varied from one to three. After determining a mean IQ test score for each individual child, reported IQ scores ranged from 41 (moderate mental deficiency) to 123 (superior). Ten scores (43%) fell more than two standard deviations below the test's mean, five (22%) fell within the "borderline" range of ability with a median score of 75, and eight scores (36%) fell within at least average limits. Of the 10 students whose IQ score was within the mentally deficient range, all were identified to be experiencing other serious health concerns (Tables 6 and 7, Figure 1).

Table 6.

IQ Scores (average score of all administrations)		
N	=	23
range	=	41 - 123
mean	=	74
median	=	75

Table 7.

Standard Score*	**IQ (N=23)** N	(%)	**ACH (N=25)** N	(%)	**Percentiles**	**Range**
≥ 120	1	(4)	0	(0)	Above 90th	Superior
110 - 119	0	(0)	2	(8)	76th – 90th	High Average
90 – 109	3	(15)	7	(28)	26th – 75th	Average
80 – 89	4	(17)	5	(20)	9th –25th	Low Average
70 – 79	5	(22)	6	(24)	2nd – 8th	Borderline
50 – 69	9	(39)	2	(8)	.08th – 2nd	Mild Mental Deficiency
35 – 49	1	(5)	2	(8)	<1st	Moderate Mental Deficiency
< 35	0	(0)	1	(4)	<1st	Severe Mental Deficiency

*Standard scores overlap in mental deficiency ranges.

Figure 1.

Averaged IQ Standardized Scores
(N=23)

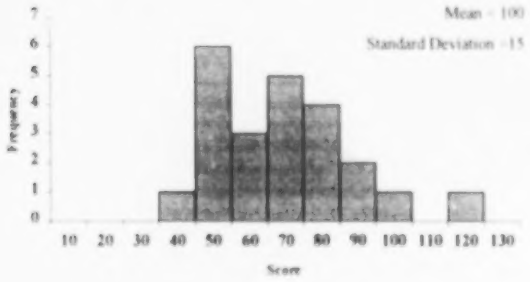
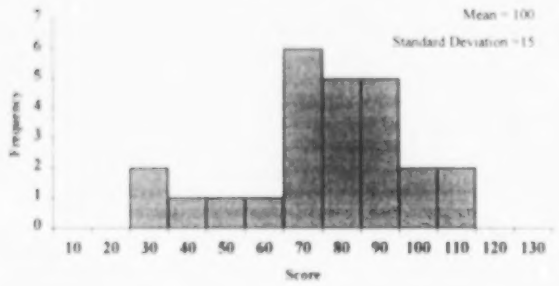


Figure 2.

Average Achievement Standardized Scores
(N=25)



Achievement test results varied from high average to severe mental deficiency. Among 25 children with at least one test result, scores ranged from 31 to 115 with a median of 80. Fourteen of the 25 scores (66%) were within the average range. Five of 25 (20%) were more than two standard deviations below the mean (Tables 7 and 8, Figure 2).

Table 8.

Achievement Scores
(average score of all administrations)

N	=	25
range	=	31 - 115
mean	=	80
median	=	80

At the time of the study, 17 children were still receiving special education services through the Anchorage School District. For these 17 children, the amount of services provided ranged from 0.5 to 34 hours per week (median, 17 hours). Various types of services were provided: 13 children received individualized instructional services, 16 received speech and language therapy; seven children received occupational or physical therapy; one child received audiology services and one child received services for the blind or visually impaired.

Discussion

We found that, in Alaska, 68% of the 53 children in this follow-up received special education services, and 83% of those in special education experienced other severe medical problems. These medical problems were of such severity that it is reasonable to suppose that affected children might have required special education services in the absence of the findings traditionally used to diagnose FAS. We do not know why this was the case. It is possible that the majority of cognitive deficits associated solely with in-utero alcohol exposure do not by themselves severely impair or predict school performance, as suggested by a recent prospective study of children diagnosed with FAS at birth (13). Instead, the causal chain which produces neurologic deficits in children exposed prenatally to alcohol may be considerably more complex, and may include the confounding or modifying effect of other prenatal exposures or postnatal factors. This hypothesis is consistent with our finding that children in our study who were enrolled in special education had a broad range of test scores using traditional school-based measures of intelligence and achievement.

Case Study **Case - 3 year old**
Medical diagnosis
Prematurity
Intraventricular hemorrhage
Seizures
Bronchopulmonary dysplasia
Post-cardiopulmonary arrest
Hypoxic ischemia
Hydrocephalus
5 Criteria FAS
Ability test – No cognitive tests – very impaired
Special Education
Multi-handicapped

A variety of prenatal events may confound or modify the association between prenatal alcohol exposure and neurologic development. Abel has noted that low socioeconomic status (SES) and heavy alcohol intake are correlated with tobacco use, poor nutrition, poor health, use of illicit drugs (such as cocaine or heroin), and increased stress, all of which may exacerbate the in-utero teratogenecity of alcohol (14). Additionally, recent studies have documented an association between premature birth and genital tract infections (15,16), and genital tract infections may be more common among women who drink alcohol during pregnancy.

Post-natal factors, most notably poverty and child abuse or neglect, may also confound or modify the association between prenatal alcohol exposure and neurologic development. Able has called poverty "the major determinant for the occurrence of FAS" (17), a statement supported by the almost complete absence in the medical literature of reports documenting FAS among children of high socioeconomic status (SES). Poverty may act by influencing a woman's decision to drink alcohol during pregnancy (18), through an association with risk factors such as sexually transmitted diseases, or by directly affecting the learning environment of the child. Additionally, studies have documented that children living below the poverty threshold are more likely to experience learning disabilities and developmental delays and to score lower on standardized tests of IQ verbal ability and achievement (19).

Women who abuse alcohol are more likely to abuse or neglect their children than other women. National estimates indicate that between 50% and 80% of families involved with child protective agencies have substance abuse problems (20). The adverse effects of abuse and neglect on children may include

cognitive, emotional, and social developmental deficits. Abused and neglected children tend to perform poorly in school and more often experience emotional problems and suicidal thoughts. Many abused children respond through aggressive, even criminal actions. The effects of abuse and neglect are profound and long lasting (20).

While child abuse and neglect by itself may adversely effect neurologic development, it may also affect development by causing social disruption. Of the 53 children in this follow-up, 24 are known to be or have been in either foster or adoptive homes while the status of 16 is unknown. This finding is consistent with our original epidemiologic investigation that showed that 67% of the five-criteria cases with known custody status were either adopted or in foster care (12).

Maternal experience of abuse or neglect as a child, or contemporary experience of domestic violence may also confound or modify the association between prenatal alcohol exposure and adverse developmental outcome (21,22). Exposure to domestic violence can be psychologically harmful to children, and studies have found that men who batter are more likely than other men to physically abuse their children while women victims are more likely to maltreat their children (20). During our original epidemiologic study, a preliminary review of maternal histories for six mothers who had produced at least two 5-criteria FAS children found documentation of physical and sexual abuse and partners with alcohol problems (11).

In summary, complex interactions may lead to adverse neurologic outcome among the children of women who drink alcohol during pregnancy. Alcohol may act as a direct toxin, as a causal factor in a more complex chain, or simply as a marker for other events that determine neurologic outcome. Finally, adverse neurologic development in a young female may itself lead to many of the risk factors associated with the future decision to drink alcohol during pregnancy.

Case Study
Case - 4 year old

Medical diagnosis
- 26 weeks prematurity
- Atrial Septal defect
- Spastic quadriplegia
- Retinopathy – Blind
- Clinodactyly
- Seizures
- Cerebral palsy
- Chronic lung disease
- Feeding gastrostomy
- Single umbilical artery

5 Criteria FAS
Ability test – 56
Special Education
- Multi-handicapped
- Blind Services

Consider the caregiver characteristics of a child in our follow-up whose exceptionality changed from serious emotional disturbance to mental retardation. The child was born to a woman who not only consumed alcohol during the pregnancy but also used tobacco and tested positive for cocaine. She worked as a prostitute and was hospitalized at five months' gestation for domestic violence. She sought no prenatal care for her pregnancy. The child, removed from its mother within 24 hours of birth, was born with major medical co-morbidities. In school, the child experienced episodes of screaming and was described as non-compliant. The child was hospitalized early in life for stabilization of hyperactivity and described as "very destructive."

Another child's medical chart showed two admissions for broken bones suffered from physical abuse. Also diagnosed with cerebral palsy, the child was "raised in a neglectful environment," according to its education record. Yet another whose only diagnosis is "possible FAS," with no medical co-morbidity, is described by teachers as "impulsive," "defiant," and "with poor anger control." The student's file notes that alcoholism is a major problem in the family and that the student's behaviors are probably based on the parents' constant "drinking and fighting."

If our hypothesis regarding the importance of multiple risk factors is accurate, then prevention strategies must target more than maternal alcohol abuse. Prevention strategies must take a more global approach and also target child abuse and neglect, domestic violence, poverty, maternal education, and maternal health. Developing and implementing specific effective prevention strategies will depend, in part, on better understanding the characteristics of parents who provide a poor home environment for their children, including those who perpetrate abuse or neglect.

It is possible that the type of impairment associated with in-utero exposure to alcohol alone may be significant and yet not identifiable with current special education screening tools. If that were the case, only those children with associated conditions would have ended up in our follow-up evaluation. Although our evaluation could not distinguish between the two possibilities, only 14 (26%) of our population-based group of children did not receive a referral, suggesting that a large pool of children with unmet educational service needs does not exist.

Because of the extensive medical morbidity among this group of children, a wide range of special education services was provided. In this group of children, the medical diagnosis of FAS did not appear to be a useful predictor of the need for any generic special education service. Most special education services were needed for medical conditions and learning problems which may not have been related to in-utero alcohol exposure. Consistent with this, the intelligence and achievement test scores found among these students with FAS demonstrated a broad range, a relative consistency between an individual's ability and achievement scores, and relative inconsistency among the 28 files containing test scores. While not all achievement test results were obtained from individually administered tests, these data suggest that the FAS designation alone has little predictive value related to academic achievement and that an "FAS IQ/achievement profile" does not exist. Whether an FAS designation alone justifies the need for special education services was not answered by the test data.

The question of using the diagnosis of FAS alone as an exceptionality category for special education services has been raised by various groups. We found that 90% of children referred and evaluated qualified for services using current exceptionalities, suggesting that most children with any medical chart notation of FAS who were referred for services would not have benefited from a change in the current method of determining eligibility.

The 14 students with a medical chart notation of FAS who were never referred for special education presumably did not have a school performance that warranted referral. Thus, before using FAS as an exceptionality, DOE should determine if interventions exist that would allow children diagnosed with FAS

who do not qualify for special education under current exceptionalities to improve their school performance.

This follow-up presents preliminary data, pending evaluation of the entire statewide cohort. Many issues await resolution, including the identification of deficits associated specifically with in-utero exposure to alcohol which might impair school performance, the prevalence of the syndrome, and the identification of school-based interventions which will alter the impact of these deficits. As the annual costs of providing services to children diagnosed with FAS in the United States has been estimated at $200 million to $1 billion, the majority of which is directed at neurologic impairment, attempts to answer these questions should receive a high priority.

Case Study **Case - 4 year old**
Medical diagnosis Cerebral palsy Retinopathy – blind in one eye Hockey stick palmar creases Prematurity Grade 3 Central Nervous System Ventricular Hemorrhage
5 Criteria FAS Ability test – No cognitive tests – very impaired Special Education Multi-handicapped Wheelchair

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